

WHAT IS CLAIMED IS:

1           1.       A method of processing a previously encoded MPEG video high-resolution (HR)  
2     file and corresponding proxy file, for frame accurate timecode repair and synchronization of  
3     individual video frames of the HR file and proxy file, comprising the following steps:

4           (a) for each video frame of the HR file and proxy file, creating a compressed timecode  
5     packet having an identifying signature, an absolute timecode of the frame, a relative timecode of  
6     the frame, a picture type and a picture reference, wherein the timecodes having the SMPTE  
7     timecode format HH:MM:SS:FF;

8           (b) modifying the HR file and proxy file by inserting in a header of each video frame of  
9     the HR file and proxy file the corresponding compressed timecode packet, while maintaining the  
10    files' original frame presentation timing;

11          (c) automatically verifying the timecodes in the HR file and proxy file timecode packets;

12          (d) if needing a repair of the HR file anomalous absolute timecodes, automatically  
13     correcting the anomalous absolute timecodes in the HR file timecode packets; and

14          (e) if the proxy file starting video frame being offset from the HR file starting video  
15     frame, automatically synchronizing the proxy file and the HR file absolute timecodes and  
16     relative timecodes in the timecode packets,

17        thereby preserving the MPEG compliance and compressed audio/video data of the HR file  
18     and proxy file.

1     2.       The method according to claim 1, wherein the timecode packet being automatically  
2     inserted in a user data packet of the video frame, between a picture start header and a first slice  
3     header.

1 3. The method according to claim 1, wherein the step of inserting the timecode packet  
2 including a step of periodically removing the MPEG video file unused data bytes, equal in  
3 number with the inserted timecode packet bytes, for preserving the MPEG video file original size  
4 and multiplex bitrate.

1 4. The method according to claim 1, wherein the step of inserting the timecode packet  
2 including a step of increasing the MPEG video file original multiplex bitrate, to compensate for  
3 additional timecode packet bytes inserted into the MPEG video file.

1 5. The method according to claim 1, wherein the step (d) further comprising a step for  
2 updating the absolute timecodes in the proxy file timecode packets.

1 6. The method according to claim 1, wherein the step (d) further comprising a step for  
2 updating absolute timecodes of each storyboard thumbnail for enabling frame-accurate  
3 composition of an edit decision list (EDL).

1 7. The method according to claim 1, wherein the step (e) further comprising:  
2 a step for inserting a synchronization metadata into the proxy file, for signaling an offset  
3 and disparity in duration of the proxy file and HR file, a timecode repair action taken, and a  
4 timecode type identifying a source of the absolute timecode as chosen from a group comprising  
5 an original source timecode, repaired timecode, elapsed timecode or house timecode, and

6 a step for marking affected frames of the proxy file as unviewable, when no  
7 corresponding frame found in the HR file.

1 8. The method according to claim 1, wherein the step (e) comprising: a step for aligning the  
2 HR file video frames and proxy file video frames using absolute timecodes, and a step for  
3 updating the relative timecodes in the proxy file timecode packets with the relative timecodes of  
4 the HR file.

1 9. The method according to claim 8, wherein in the aligning step of step (e), if the proxy file  
2 having accurate absolute timecodes, aligning the absolute timecodes of the HR file and proxy  
3 file, and if not, using closed captioning for aligning the proxy file and HR file, and copying the  
4 absolute timecodes from the HR file into the proxy file timecode packets.

1 10. The method according to claim 9, wherein the closed captioning step, if the HR file and  
2 proxy file not being closed captioned, further comprising a step, at the start of the aligning step,  
3 for inserting into a predetermined number of video frames of the HR file and proxy file a closed  
4 caption data stream for locating and aligning an identical video frame in the HR file and proxy  
5 file, and, after the file aligning step, a step for removing the inserted closed caption data stream  
6 from the HR file and proxy file.

1 11. A system for processing a previously encoded MPEG video high-resolution (HR) file and  
2 corresponding proxy file, for frame accurate timecode repair and synchronization of individual  
3 video frames of the HR file and proxy file, comprising:

4 a computer coupled to an electronic storage device for storing the MPEG video files;

5 programming means, performed by the computer, for creating for each video frame of the  
6 HR file and proxy file, a compressed timecode packet having an identifying signature, an  
7 absolute timecode of the frame, a relative timecode of the frame, a picture type and a picture  
8 reference, wherein the timecodes having the SMPTE timecode format HH:MM:SS:FF;

9 programming means, performed by the computer, for modifying the HR file and proxy  
10 file by inserting in a header of each video frame of the HR file and proxy file the corresponding  
11 compressed timecode packet, while maintaining the files' original frame presentation timing;

12 programming means, performed by the computer, for automatically verifying the  
13 timecodes in the HR file and proxy file timecode packets;

14 programming means, performed by the computer, for automatically correcting the  
15 anomalous absolute timecodes in the HR file timecode packets; and

16 programming means, performed by the computer, for automatically synchronizing the  
17 proxy file and the HR file absolute timecodes and relative timecodes in the timecode packets,

18 thereby preserving the MPEG compliance and compressed audio/video data of the MPEG  
19 video file.

1 12. The system according to claim 11, wherein the timecode packet being automatically  
2 inserted in a user data packet of the video frame, between a picture start header and a first slice  
3 header.

1 13. The system according to claim 11, wherein the means for inserting the timecode packet  
2 further comprising means for periodically removing the MPEG video file unused data bytes,  
3 equal in number with the inserted timecode packet bytes, for preserving the MPEG video file  
4 original size and multiplex bitrate.

1 14. The system according to claim 11, wherein the means for inserting the timecode packet  
2 further comprising means for increasing the MPEG video file original multiplex bitrate, to  
3 compensate for additional timecode packet bytes inserted into the MPEG video file.

1 15. The system according to claim 11, wherein the means for automatically correcting the  
2 anomalous absolute timecodes in the HR file timecode packets further comprising means for  
3 updating the absolute timecodes in the proxy file timecode packets.

1 16. The system according to claim 11, wherein the means for automatically correcting the  
2 anomalous absolute timecodes in the HR file timecode packets further comprising means for  
3 updating absolute timecodes of each storyboard thumbnail for enabling frame-accurate  
4 composition of an edit decision list (EDL).

1 17. The system according to claim 11, wherein the means for automatically synchronizing  
2 the proxy file and the HR file absolute timecodes and relative timecodes in the timecode packets  
3 further comprising:

4 means for inserting a synchronization metadata into the proxy file, for signaling an offset  
5 and disparity in duration of the proxy file and HR file, a timecode repair action taken, and a  
6 timecode type identifying a source of the absolute timecode as chosen from a group comprising  
7 an original source timecode, repaired timecode, elapsed timecode or house timecode, and  
8 means for marking affected frames of the proxy file as unviewable, when no  
9 corresponding frame found in the HR file.

1 18. The system according to claim 11, wherein the means for automatically synchronizing  
2 the proxy file and the HR file absolute timecodes and relative timecodes in the timecode packets  
3 comprising: means for aligning the HR file video frames and proxy file video frames using  
4 absolute timecodes, and means for updating the relative timecodes in the proxy file timecode  
5 packets with the relative timecodes of the HR file.

1 19. The system according to claim 18, wherein the means for automatically synchronizing  
2 the proxy file and the HR file absolute timecodes and relative timecodes in the timecode packets  
3 comprising: means for aligning the absolute timecodes of the HR file and proxy file, and closed  
4 captioning means for aligning the proxy file and HR file and copying the absolute timecodes  
5 from the HR file into the proxy file timecode packets.

1 20. The system according to claim 19, wherein the closed captioning means further  
2 comprising: means for inserting into a predetermined number of video frames of the HR file and  
3 proxy file a closed caption data stream for locating and aligning an identical video frame in the

4 HR file and proxy file, and means for removing the inserted closed caption data stream from the  
5 HR file and proxy file after the alignment.

1 21. A program storage device readable by a computer tangibly embodying a program of  
2 instructions executable by the computer to perform method steps of processing a previously  
3 encoded MPEG video high-resolution (HR) file and corresponding proxy file, for frame accurate  
4 timecode repair and synchronization of individual video frames of the HR file and proxy file, the  
5 MPEG video files stored in an electronic storage device coupled to the computer, the method  
6 comprising the following steps:

7 (a) for each video frame of the HR file and proxy file, creating a compressed timecode  
8 packet having an identifying signature, an absolute timecode of the frame, a relative timecode of  
9 the frame, a picture type and a picture reference, wherein the timecodes having the SMPTE  
10 timecode format HH:MM:SS:FF;

11 (b) modifying the HR file and proxy file by inserting in a header of each video frame of  
12 the HR file and proxy file the corresponding compressed timecode packet, while maintaining the  
13 files' original frame presentation timing;

14 (c) automatically verifying the timecodes in the HR file and proxy file timecode packets;

15 (d) if needing a repair of the HR file anomalous absolute timecodes, automatically  
16 correcting the anomalous absolute timecodes in the HR file timecode packets; and

17 (e) if the proxy file starting video frame being offset from the HR file starting video  
18 frame, automatically synchronizing the proxy file and the HR file absolute timecodes and  
19 relative timecodes in the timecode packets,

20           thereby preserving the MPEG compliance and compressed audio/video data of the HR file  
21   and proxy file.

1   22.    The method according to claim 21, wherein the timecode packet being automatically  
2   inserted in a user data packet of the video frame, between a picture start header and a first slice  
3   header.

1   23.    The method according to claim 21, wherein the step of inserting the timecode packet  
2   including a step of periodically removing the MPEG video file unused data bytes, equal in  
3   number with the inserted timecode packet bytes, for preserving the MPEG video file original size  
4   and multiplex bitrate.

1   24.    The method according to claim 21, wherein the step of inserting the timecode packet  
2   including a step of increasing the MPEG video file original multiplex bitrate, to compensate for  
3   additional timecode packet bytes inserted into the MPEG video file.

1   25.    The method according to claim 21, wherein the step (d) further comprising a step for  
2   updating the absolute timecodes in the proxy file timecode packets.



1 26. The method according to claim 21, wherein the step (d) further comprising a step for  
2 updating absolute timecodes of each storyboard thumbnail for enabling frame-accurate  
3 composition of an edit decision list (EDL).

1 27. The method according to claim 21, wherein the step (e) further comprising:  
2 a step for inserting a synchronization metadata into the proxy file, for signaling an offset  
3 and disparity in duration of the proxy file and HR file, a timecode repair action taken, and a  
4 timecode type identifying a source of the absolute timecode as chosen from a group comprising  
5 an original source timecode, repaired timecode, elapsed timecode or house timecode, and  
6 a step for marking affected frames of the proxy file as unviewable, when no  
7 corresponding frame found in the HR file.

1 28. The method according to claim 21, wherein the step (e) comprising: a step for aligning  
2 the HR file video frames and proxy file video frames using absolute timecodes, and a step for  
3 updating the relative timecodes in the proxy file timecode packets with the relative timecodes of  
4 the HR file.

1 29. The method according to claim 28, wherein in the aligning step of step (e), if the proxy  
2 file having accurate absolute timecodes, aligning the absolute timecodes of the HR file and proxy  
3 file, and if not, using closed captioning for aligning the proxy file and HR file, and copying the  
4 absolute timecodes from the HR file into the proxy file timecode packets.

1 30. The method according to claim 29, wherein the closed captioning step, if the HR file and  
2 proxy file not being closed captioned, further comprising a step, at the start of the aligning step,  
3 for inserting into a predetermined number of video frames of the HR file and proxy file a closed  
4 caption data stream for locating and aligning an identical video frame in the HR file and proxy  
5 file, and, after the file aligning step, a step for removing the inserted closed caption data stream  
6 from the HR file and proxy file.

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